National Institute of Environmental Health Sciences

Influences of climate on aflatoxin producing fungi and aflatoxin contamination

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Abstract:

Aflatoxins are potent mycotoxins that cause developmental and immune system suppression, cancer, and death. As a result of regulations intended to reduce human exposure, crop contamination with aflatoxins causes significant economic loss for producers, marketers, and processors of diverse susceptible crops. Aflatoxin contamination occurs when specific fungi in the genus Aspergillus infect crops. Many industries frequently affected by aflatoxin contamination know from experience and anecdote that fluctuations in climate impact the extent of contamination. Climate influences contamination, in part, by direct effects on the causative fungi. As climate shifts, so do the complex communities of aflatoxin-producing fungi. This includes changes in the quantity of aflatoxin-producers in the environment and alterations to fungal community structure. Fluctuations in climate also influence predisposition of hosts to contamination by altering crop development and by affecting insects that create wounds on which aflatoxin-producers proliferate. Aflatoxin contamination is prevalent both in warm humid climates and in irrigated hot deserts. In temperate regions, contamination may be severe during drought. The contamination process is frequently broken down into two phases with the first phase occurring on the developing crop and the second phase affecting the crop after maturation. Rain and temperature influence the phases differently with dry, hot conditions favoring the first and warm, wet conditions favoring the second. Contamination varies with climate both temporally and spatially. Geostatistics and multiple regression analyses have shed light on influences of weather on contamination. Geostatistical analyses have been used to identify recurrent contamination patterns and to match these with environmental variables. In the process environmental conditions with the greatest impact on contamination are identified. Likewise, multiple regression analyses allow ranking of environmental variables based on relative influence on contamination. Understanding the impact of climate may allow development of improved management procedures, better allocation of monitoring efforts, and adjustment of agronomic practices in anticipation of global climate change.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality, Precipitation, Temperature

Extreme Weather Event: Drought

Food/Water Quality: Biotoxin/Algal Bloom

Temperature: Extreme Heat

Geographic Feature: ☑

resource focuses on specific type of geography

Desert

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Cancer, Developmental Effect, Injury, Other Health Impact

Developmental Effect: Other Functional Deficit

Other Health Impact: Immune system suppression

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Children

Resource Type: ☑

format or standard characteristic of resource

Review

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content